February 15, 2018

Julius P. Knapp
Chief, Office of Engineering and Technology
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: Update regarding topics discussed in Amendment of Part 15 of the Commission's Rules for Unlicensed White Space Devices, Notice of Proposed Rulemaking and Order
ET Docket 14-165; RM-11745

Dear Mr. Knapp:

The TV White Space (TVWS) device manufactures, co-signees of this joint letter, represent a majority of the TVWS devices certified and deployed in the United States. We appreciate the continued efforts by the Commission on iterative improvements of the Part 15 rules pertinent to TVWS operations. As the main radio suppliers to the TVWS ecosystem, we have unique qualification and responsibility in providing field experiences as real-time input to help inform the Commission in making further refinement to its TVWS rules[1].

Since the release of the White Space Geolocation Notice of Proposed Rule Making (NPRM)[2], the TVWS Device Manufacturers have invested significant R&D effort in implementing automatic geo-location reporting capabilities into our radio products. While we have made substantial progress in our products collectively, we also verified that automatic geo-location capability unfortunately does not always provide a complete or practical solution to the geo-location accuracy objective that the February 2016 NPRM is seeking to achieve. Through field testing, each radio vendor has independently arrived at the same conclusion that automatic geo-location reporting using GPS has the following three key limitations:

---

[1] Code of Federal Regulations, Title 47, Part 15, Subpart H.
[2] Amendment of Part 15 of the Commission's Rules for Unlicensed White Space Devices, Notice of Proposed Rulemaking and Order, 31 FCC Rcd 1657 (Feb. 26, 2016).

1. For outdoor deployment with clear visibility of GPS signals, current consumer GPS technology can only achieve +/- 15-meter vertical coordinate accuracy. The Commission's rules specify that the transmit antenna of a fixed TVWS device shall not exceed 30 meters above ground level (AGL). Relative to the 30-meter fixed TVWS antenna AGL limitation, +/- 15-meter uncertainty is a significant margin of error that could result in either overprotection (if vertical position is over-reported) or under-protection of the incumbent (if vertical position is under-reported). Neither scenario is desirable nor acceptable. Fixed TVWS radios operating well within the rules for antenna height AGL may be denied a list of available channels because of the inaccurate vertical coordinate automatically reported back to the white spaces database (WSDB).

2. The NPRM proposed that when a fixed TVWS device contacts the database at least once daily to receive an updated list of available channels at that location, the TVWS device provides its geolocation coordinates. Due to the +/- 15-meter uncertainty of GPS, this proposed requirement, if adopted, would make it impossible to operate a commercial network reliably. Assuming no change to the list of protected incumbents, the day-to-day variability in the automated recording of the TVWS antenna's vertical coordinate will create uncertainty over whether the WSDB will provide the same list of available channels at that location, let alone any list of available channels from one day to the next.

3. For indoor deployments where GPS signals are often not receivable, automatic geo-location reporting will simply fail to function.

In the first and third scenarios, the deployments had to resort back to manual geo-location entry by professional installers. In such cases, eliminating professional installers option as proposed in the NPRM would in fact reduce the geo-location accuracy on the vertical axis, and render certain indoor use cases unattainable. Based on current and foreseeable technology capabilities, there exists no complete automatic geolocation solution that could ensure location data accuracy in all axis and in all indoor and outdoor locations.

As such, the TVWS Device Manufacturers recommend that the Commission retains the professional installers option as provisioned in the current Part 15 rules and permit professional installers to measure and input the vertical height coordinate of the fixed TVWS device antenna. This will not only overcome the inherent uncertainty of GPS based systems but will also address instances where is a separation between TVWS antenna and the GPS receiver & antenna. We also recommend that additional measures be taken to ensure that professional installers, their employers or those who contract with them, are accountable for the accuracy of manual data entries. Finally, we recommend that fixed TVWS devices should not have to report its geo-coordinates each time it contacts the WSBD to obtain the list of available channels.

By allowing the additional flexibility of the above, the Commission will advance its efforts to put in place rules that unlock the benefits of white space operations without causing harmful interference to incumbent licensees.

Respectfully submitted,

Robert Wu
CEO 6Harmonics, Inc.

Haiyun Tang
CEO Adaptrum, Inc.

James Carlson
CEO Carlson Wireless Technologies, Inc.

Jordan DuVal
CEO MELD Technologies, Inc.

Robert Williams
CEO Redline Communications, Inc